The Forest Stewards: using tradition to conserve New Guinea's Star Mountain wilderness

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Abstract: The Star Mountains wilderness on the island of New Guinea presents a unique opportunity to conserve a region of global significance. Stretching for nearly 300 km, it straddles the international boundary of the independent nation of Papua New Guinea and the Indonesian province of West Papua. This is the largest stand of forest in the Pacific and may be the most biologically diverse area in New Guinea. It is also the source of New Guinea's four great rivers and the continued viability of New Guinea's coastal ecosystems and reefs depends on the quality of this watershed. However, a conservation project of this magnitude can only succeed with the cooperation of the local people. In this paper, I describe an initiative for creating partnerships with the local people called "The Forest Stewards", that is being piloted with the Hewa people at the headwaters of the Strickland River. The aim of the Forest Stewards initiative is to conserve both the biological diversity of this region and the cultural diversity that has shaped it by fostering environmental and cultural stewardship in traditional forest societies. We are helping these societies to market their traditional knowledge by building formal relationships with nonprofit institutions such as museums, universities or NGO's that will pay for the opportunity to manage the collections that the Forest Stewards communities make available. Participating communities agree to become partners with these institutions to manage their traditional knowledge. This initiative requires the participants to steward the forests and traditions that have shaped them, but offers traditional societies an alternative to deforestation.

Key words: New Guinea, conservation, traditional knowledge, Forest Stewards, Star Mountains.

Introduction

The island of New Guinea is renowned for its biological and cultural diversity. It has been estimated that 1200 distinct languages are spoken on this island and it has forests rivaling those found in Amazonia. New Guinea has retained 75 percent of its original vegetation and is home to over 700 species of birds, the world's largest and smallest parrots, the largest pigeons and the world's largest butterfly - Queen Alexandra' Bird-wing (*Ornithoptera alexandrae* Rothschild, 1907). The island contains an estimated 9000 species of plants, including 1500 species of trees and 2700 species of orchids (Meyers et al. 2000).

The Star Mountains wilderness, which straddles the international boundary of the independent nation of Papua New Guinea (PNG) and the Indonesian province of West Papua, is the largest and the most significant expanse of forest on the island. Cutting through the heart of the New Guinea (Fig. 1), the headwaters of New Guinea's four great rivers: the Digul, the Fly, the Sepik, and the Idenburg all originate in this region. This vast natural area stretches for nearly 300 kilometers and is virtually unexplored. Recent analyses have identified this rainy upland zone as the richest in biodiversity in this island (Beehler 1993). This region is also home to some of New Guinea's most remote societies. The conservation of the Star Mountains is vital not only to these societies, but also to the continued viability of New Guinea's coastal ecosystems and reefs - unique marine ecosystems that rely on the pristine waters delivered by the uplands of the Star Mountains. A conservation project of this magnitude can only succeed through the cooperation of the local people. The cultures inhabiting this region represent a treasure house of knowledge and are potential partners in the conservation of a globally significant wilderness. Rather than squander this opportunity by creating a "paper park" (i.e. a park that exists on national maps but has no local support), we have chosen to pursue a more dynamic strategy by creating partnerships with the local people to conserve both the biological diversity of this region.

In what follows, I will introduce a program that we are piloting with the Hewa people of Papua New Guinea called the "Forest Stewards" that we believe will become the model for conserving the Star Mountains wilderness. This program combines modern ecology with traditional environmental knowledge to produce a partnership aimed at conserving the biological and cultural heritage of the Hewa. The Forest Stewards differs from many conservation programs that have partnered with indigenous people in one very important respect -- it does not rely on the special relationship indigenous people have with their lands to conserve biological diversity. Instead it treats traditional human activity as a source of disturbance that must be harnessed so that it continues to produce a biologically diverse landscape.

Background

Today the homelands of indigenous societies contain much of the earth's remaining biological heritage (Robles 2002). The apparent compatibility of tradition with biological diversity has, in turn, spawned an interest in understanding traditional management systems (Barrett et. al. 2001); collecting traditional ecological knowledge (TEK) (Folke 2004; Ludwig et al. 2001); and potentially using traditional practices as templates for biodiversity conservation (Posey 1988). This in turn has opened the possibility of cooperation between two groups that might seem to be natural allies - conservationists and indigenous people (Nabhan 2001). Advocates for this alliance had essentially assumed that indigenous societies had learned to minimize their impact on the land (Smith 1984).

The idea that indigenous people have a special relationship with their land - a relationship that has prevented them from destroying their biological heritage and will enable them to continue to conserve their lands for future generations, is one of our most cherished stereotypes. Yet prior to embarking on these partnerships for conservation, no consensus had emerged concerning the relationship between traditional life and biological diversity (West, Brechin 1991). For many, the twenty-year experiment of involving indigenous people in conservation is proving to be a disaster for nature and the enthusiasm for partnerships with indigenous communities has waned (Soule 2000; Chatty, Colchester 2002; Chapin 2004). The importance of local involvement in conservation may have blinded advocates to the realities of traditional life. Is it the aim of traditional land managers to conserve biodiversity or is biodiversity an unintentional side-effect of traditional life (Posey, Balee 1989; Parker 1992; Smith, Wishnie 2000)?

I propose that in order to reverse the current trends, we will first need to deconstruct this latest version of the noble savage by removing the

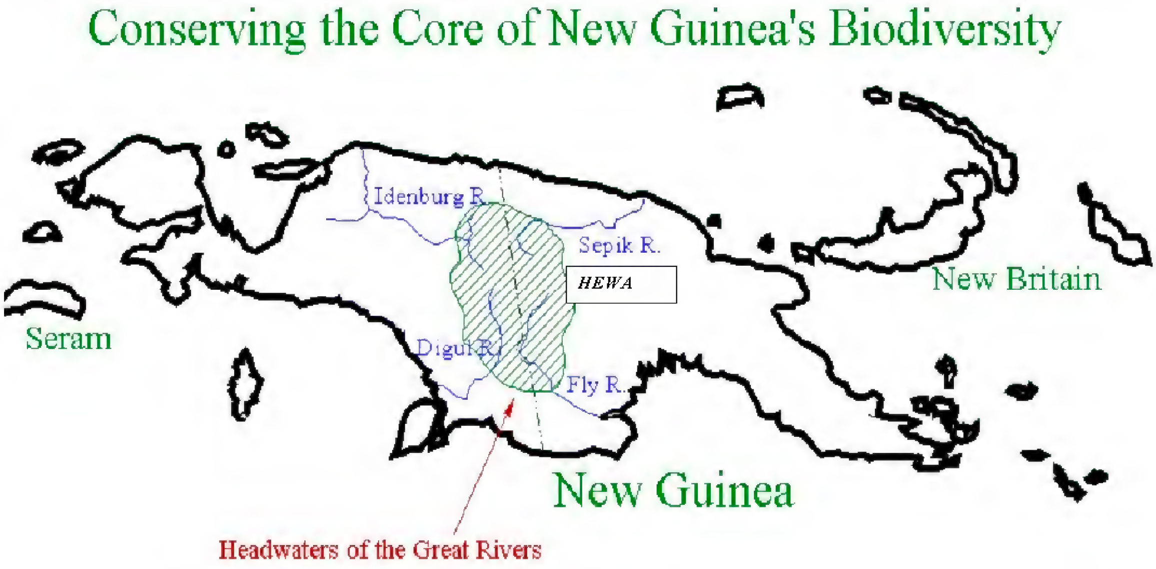
Conserving the Core of New Guinea's Biodiversity
Idenburg R.
Sepik R.
HEWA
New Britain
Seram
Digul R.
Fly R.
New Guinea
Headwaters of the Great Rivers

Figure 1. The Star Mountains wilderness stretches for about 300 km and contains some of the richest biodiversity in Papua New Guinea. Its biological impact is felt all the way to the coasts and reefs of the island, making its conservation a vital priority. It is also home to great cultural diversity and communities who have rich heritages and intimate knowledge about the land and its species.

burden of maintaining a “balance” with nature and reconciling human activity with disturbance and its role as the creator and destroyer of biodiversity. While the romanticized version of a traditional society living in balance with it’s surrounding may be appealing, it flies in the face of historical evidence (Diamond 1986; Denevan 1992). In light of our ability to now see organisms invisible to the naked eye and understand their connection to functioning ecosystems, it seems a reach to expect indigenous landowners to anticipate the needs of organisms they cannot see. Moreover, there has been a shift by ecologists from a focus on balance to disturbance in ecosystems that has gone unrecognized by those who continue to portray traditional societies as “in balance” with their surroundings (Smith 1984; Hames 1991).

It had been assumed that the most biologically diverse ecosystems were the most stable (Reice 1994). This assumption fit nicely with the traditional western view of the universe as a collection of parts, connected into a machine-like system that has been designed to be predictable, balanced and ultimately controllable by humans (Goerner 1994). Under this rubric, a balanced ecosystem is therefore a stable system in terms of species composition (Reice 1994). From this perspective, the conservation of tropical forests will require that we develop a complete inventory of the species in the system, detailing how each species is connected to one another. Once this “blueprint” for conservation is developed, our goal will be to maintain this system of internal relationships – i.e. the balance or equilibrium of the system. So much of the science needed to conserve our natural world consists of developing an inventory of these parts, that it seems that we have been developing such blueprints. Yet success in the form of a final product or blueprint has eluded us. Natural systems have proven to be extremely complex, difficult to define and rarely, if ever, in a state of equilibrium. After centuries of cataloguing nature’s parts, the world continues to be a frustrating machine to keep in balance.

The difficulty in defining extremely complex systems has led ecologists to abandon the equilibrium model and instead concentrate on the dynamic components of an ecosystem (Pickett et al. 1991). In this dynamic paradigm, the balance of nature concept is described as non-scientific (Pickett, White 1985). Unfortunately, the shift has gone unrecognized by many anthropologists (Smith 1984:3). Authors continue to portray traditional societies as “in balance” or describe a practice as “adaptive”. Yet, this use of terms drawn from ecology and evolutionary biology is often outmoded (Hames 1991). Current ecological research has instead focused on the role of non-equilibrium factors, commonly referred to as disturbance, in the enhancement of biodiversity (Reice 1994:924). Ecologists define a disturbance as any “relatively discrete event that disrupts a population, community or ecosystem and changes resources available” (Pickett, White 1985). Disturbance is unpredictable, nonselective and can produce effects that will vary from minutes to centuries in duration (Pickett et al. 1991). Disturbance can come in any size, at any time and produce effects that will vary from minutes to centuries in duration. It should not to be confused with predation because predation is intrinsic to the life of the prey species’ - prey adapt to it (Reice 1994:428). While we typically think of disturbance as phenomena like storms that originate outside of an ecosystem, ecologists have discovered rich, dynamic and unpredictable behavior arising from the internal dynamics of laboratory populations without an external source of disturbance (May 1989:37). Disturbance creates the patchiness that characterizes many environments and this patchiness translates into niches that present opportunities for colonization by new species (May 1989). By creating a mosaic of environments that prevents the extinction of competing species, disturbance serves to promote a high degree of species richness (Connell 1978). Recovery from disturbance - not equilibrium - is the normal state of affairs in any ecosystem (Reice 1994:427).

The underlying assumption of much of the research into the relationship between traditional societies and their environment has been that these non-western societies have learned to minimize their impact, i.e. not disturb the balance of nature. However, not only does the research indicate that ecosystems are rarely, if ever, in a state of equilibrium; it also seems that greater species diversity is found in systems that experience disturbance. Therefore there is no sense in searching for clues to an indigenous society’s ability to maintain the natural balance in ecosystems that have no inherent tendency toward balance. Instead, I believe that traditional activities should be examined as possible sources of disturbance. Essentially the linkage between diversity and disturbance can be reduced to this: In terms of its ability to generate biodiversity, disturbance is a scale related phenomena. It enriches two measures of diversity by creating more habitats (gamma diversity) and containing more organisms (greater alpha diversity) than an unaltered landscape. Too much or too little disturbance produces environments that are not as diverse as those that are continually subjected to minor disturbances (Terborgh 1992).

The implications of the above mentioned research have forced conservationists to reconsider our notions concerning the nature of wilderness (Mittemeyer et. al. 2003). Nowhere has this paradigm shift had more impact than in Amazonia. The Amazonia wilderness, while home to incredible biodiversity, is not “pristine” in the sense that it is untouched by humans (Balée 1995). Here historical ecologists have begun to paint a more nuanced picture of the relationship of traditional societies to biological diversity, characterizing Amazonian forests as a tribute to the “immense transformative power of prehistoric humans” (Graham 1998). Amazonian societies are now seen as master manipulators, intensely managing their forests to produce a mosaic of habitats (Posey 1985; Johnson 1989; Balée 1994). While the biological diversity of any plot may initially plummet as it the land is manipulated – i.e. cleared for gardens -- this decline in diversity is not necessarily permanent and in many cases will eventually become part of a mosaic with greater diversity than the original landscape (Balée 1998). Societies in New Guinea, like their Amazonian counterparts, have been described as developing traditions that enable them to coexist with biological diversity (Sillitoe 1996). Yet if practices like gardening are in fact small-scale disturbances that traditionally have created biologically diverse mosaics, they will have important implications for the ability of local people to become partners in the conservation of their lands.

The Hewa

The Hewa number fewer than 2000, yet they are the only inhabitants of about 65000 hectares of hilly and submontane forest in the uppermost Strickland River, a region on the eastern edge of the Star Mountains wilderness. This area is extremely rugged. There are no roads, few airstrips and none of the fertile valleys found in New Guinea’s highlands. In 1993, a national conservation needs assessment identified this are as a conservation priority for the nation of Papua New Guinea (Swartzendruber 1993). The microclimate associated with altitude and terrain effectively confines Hewa horticulture between the altitudes of 500 m at the riverbank and the base of the mountain wall at 1500 m, with the majority of these gardens below 1000 m. The Hewa raise their gardens, relying primarily on sweet potato (*Ipomoea batatas*), yams (*Dioscorea* sp.), banana (*Musa* sp.) and to a lesser degree cassava (*Manihot esculenta*) and pumpkin (*Cucurbita maxima*) as food crops. Scattered throughout the area are several species of *Pandanus* and *Pangium edule* trees that the Hewa claim individually. The seasonal ripening of these trees, as well as gathering other wild foods and hunting, provides the Hewa with some sustenance. However gardens are the primary source of food. Each year the typical household clears and plants an average of four 100 m^2 gardens. Like many New Guineans, the Hewa re-use their gardens. In order to use as much of the fence surrounding an old garden as possible, the Hewa cut new gardens adjacent to previous ones, thereby creating a chain of old and new gardens. The established gardens seldom lie fallow for more than twenty-five years, at which time their secondary forest cover is cut, burned and cleared and a new garden planted. The result is a mosaic on the surrounding hillsides comprised primarily of primary forest interspersed with small plots of land in the garden / fallow cycle. This mosaic of new gardens, grasslands, succession and primary forest increases the number of environments and hence one measure of the biodiversity of this territory. It is the gardening cycle that is the most important factor in shaping this environment and has the greatest implications for conservation of these forests.

However in over twenty years of fieldwork, I have never heard the Hewa use the term “balance” to describe their relationship to the land. Instead the Hewa describe their traditional activities as creating a mosaic of garden *Agwe*, grassland *Poghali*, old garden *Agwe Teli*, old garden “true” *Agwe Teli Popi* and primary forest *Nomakale* - each with a set of pollinators and seed dispersal agents that are impacted by the Hewa cutting the forest to establish and maintain gardens. Because New Guinea is east of the Wallace line, the island lacks many of the mammalian agents of seed dispersal found to the west in Indonesia. In order to assess the compatibility of the traditional Hewa lifestyle with biodiversity, I have asked my informants to describe the impact of traditional gardening on New Guinea’s primary agents of seed dispersal -- birds. Well known to both local and international naturalists, birds are the key to forest conservation in New Guinea (Schodde 1973).

As the sole speakers of their language, the Hewa are the gatekeepers of the millennia of observations about the natural world embedded in their language and culture. The biggest difficulty in working with a population that speaks a unique language is obviously communication. In this case, the problem of cross-cultural communication was complicated by our desire to establish a common understanding between Hewa and western naturalists concerning the relationship between tradition and biodiversity that would become the basis for a local conservation plan. Ultimately, the Hewa understanding of birds has provided us with a way to use traditional knowledge to facilitate cross-cultural communication. Birds are an established indicator of biological diversity (Schodde 1973; Coates 1985; Beehler et. al. 1986). By recording traditional knowledge of birds and the impact of human activity on them, we have established a common ground on which to build a conservation program for these forests. These techniques have been recognized by UNESCO as a "Best Practice" in the use of indigenous knowledge (http://www.unesco.org/shs/most).

Like western ornithologists, the Hewa associate species with altitude and habitat. Although the western genus and species classifications do not correspond to the Hewa folk taxa (to date the 184 bird species correspond to 128 folk taxa), it is more important for our purposes that my Hewa informants recognize the impact that human disturbance of the primary will forest will have on avian diversity. As expected, the Hewa are keenly aware of the linkage between a birds and habitat. They indicate that some species are associated exclusively with primary forest and that others can make use of forests that the Hewa describe as the oldest secondary forest growth, i.e. forest that has been growing for twenty or more years. Experience has taught the Hewa that cutting the primary forest will eliminate at least thirty-three percent of birds (56 species) that can only live in primary forest. The effect of gardening on the habitat preferences of fruit and nectar eating birds is particularly important to biodiversity conservation because, if the scale of habitat modification / disturbance is of sufficient magnitude, the Hewa will compromise the forest's ability to regenerate by limiting the habitats preferred by the agents of regeneration -- fruit and nectar eating birds.

According to the Hewa, frugivores are rare in secondary forest growth that is younger than twenty years. Their gardens create an environment that is hostile to the fruit-doves (*Ptilinopus* sp.) and some species of lorikeets (*Charmosyna* sp.). Both species are vital to forest regeneration. In general, the Hewa report that human disturbance creates environments that are hostile to many species identified exclusively with New Guinea's forests. The vulturine parrot *Psittrichas fulgidus* (Lesson, 1830), pheasant pigeon *Otidiphaps nobilis* (Gould 1870), blue-collared parrot *Geoffroyus simplex* (Meyer 1874), wattled brush turkey *Aepypodius arfakianus* (Salvadori, 1877), hornbill *Rhyticeros plicatus* (Forster, 1781), flame bowerbird *Sericulus aureus* (Linneaus, 1758), and purple-tailed imperial pigeon *Ducula rufigaster* (Quoy et Gaimard, 1830) are just a few of the species that the Hewa say will not be found in secondary forests.

The Forest Stewards Initiative

Armed with a common understanding of the effects of habitat disturbance on biodiversity as well as our desire to create a sustainable future for future generations, we launched an initiative aimed at conserving the bio-cultural phenomenon (see Maffi 2001) of the Hewa and their forests called the Forest Stewards initiative. The most valuable things that the Hewa have are their forests and traditions. Rather than expect the Hewa to forego the sale of their forests, we decided to capitalize these assets by marketing their forests and traditions to institutions that value them intact, such as universities. In exchange for payment, the Hewa have agreed to keep their forests intact and their TEK alive.

In 2005, the first stage of the Forest Stewards initiative began with the Hewa in the Southern Highlands province of Papua New Guinea. Although the Hewa come in contact with their more affluent highland neighbors, they have no economic opportunities in their homeland and remain semi-nomadic subsistence farmers. They see the Forest Stewards program as an opportunity to develop a school, an aid post and some small businesses that will make life better for all without sacrificing their land to logging or mining interests. We launched the initiative by first developing a team of mentors. Before we could market the traditional knowledge of the Hewa, it was necessary to assemble a team of local experts. These would be the first Hewa to work with our partner institutions. Over the years of working with the Hewa, I have developed a reputation as a willing student who paid for the most knowledgeable mentors. This reputation made it easy to attract the finest Hewa teachers once we were ready to launch the Forest Stewards project.

In this initial stage of the project, there were many more applicants for the Forest Stewards positions than we could accommodate. For the current Hewa project at Wanakipa station, I interviewed over 40 potential applicants for mentor positions with the Forest Stewards project. Fifteen-one from each of the clans that occupy the mountains around the confluence of the Strickland and the Laigaip - were chosen to participate in the natural history portion of the Forest Stewards. Positions are filled through competitive examinations and paid according to the customary wage rate set by the local community.

Next the participants chose to create “Living Classrooms” along the streams and valleys that are the forest drainages and the local clan territorial boundaries. These natural boundaries act as wildlife corridors and have been dubbed “Roads of the Cassowary”. Each will be allowed to return to primary forest and used by the Forest Stewards as classrooms to instruct the next generation. No gardens will be cut here. These will in effect become game corridors that will extend from the river’s edge to the mountaintop (500-1500 m). These corridors will thread between the scattered gardens and stages of succession forest to link cassowary habitat across the valleys. Cassowaries, the largest birds in New Guinea, will be protected in these areas. The cassowary is the most charismatic of the local fauna and an excellent indicator of ecosystem diversity. Although cassowaries are plentiful above 800 meters, my Hewa mentors understand that the habitat simplification that comes with gardening and the establishment of a station at Wanakipa have created habitat that cassowaries avoid. By allowing the drainages to return to climax forest, future Hewa generations should experience cassowaries at all elevations.

For other game hunting, only traditional hunting with bows will be allowed along these boundaries. The Forest Stewards will monitor these areas using digital cameras, making monthly patrols for which they will receive a monthly compensation of $30. Each patrol should take approximately four days or 48 days per year per mentor.

Finally, along with their role as guardians of these “Living Classrooms”, Forest Steward mentors will each be assigned an apprentice who will accompany them in their work on the monthly surveys of the corridors. Apprentices will be tested on a yearly basis by the Advisory Committee to ascertain their progress as a student of traditional environmental knowledge. After successfully completing each of the five stages of the examination process, I anticipate that each apprentice will eventually inherit their mentor’s work.

We estimate that it will take ten years for each Forest Stewards project to become self-sustaining. Our initial Forest Stewards project with the Hewa is off to a good start. We are helping the Hewa to capture their traditions and have created a “business” based upon their environment, culture and knowledge that is unique to that site. To date, the project has attracted researchers from the Harvard Museum and Montclair State University, as well as creating partnerships with the Indo-Pacific Conservation Alliance and the Bishop Museum. We have begun working with scientist from these institutions to build the collections of plants and creatures (the “product”), that will become the foundation of our income generating / business activities. Participants in the Forest Stewards program are being helped to “market” their traditional assets and knowledge through special relationships with nonprofit research institutions. These “buyers” of indigenous knowledge would be natural history museums, universities and conservation organizations. Communities who participate in the Forest Stewards program agree to become partners with these institutions, who will then assist them in managing their traditional knowledge by making the community’s shared collections available to “buyers”. Ranging from the general public to researchers, these buyers will, in turn, pay for the opportunity to study the collections that the Forest Stewards communities are willing to make available. The buyers will not actually “own” anything. Instead they will market and manage their collection for the benefit of the partnership - the institution and the local community. The intellectual property will belong to the community in perpetuity and with Forest Stewards approval will be available for study by bona fide researchers.

Meanwhile, other interested communities in the Star Mountains have expressed an interest in establishing a Forest Stewards program in their communities. During the next three years, I anticipate continuing the program with the Hewa, and beginning another Forest Stewards program with two societies in the Strickland drainage - the Sisimen on the north side of the Om River and the Mt. Kajende people at the headwaters of the Laigaip River. If funding allows, the same process of conserving biodiversity and tradition, will begin in the Star Mountains on the Indonesian side of New Guinea.

While the Forest Stewards project is gaining momentum, there is much to do. We will need to spend much of the next decade creating the infrastructure that will allow the Forest Stewards project to be self-sustaining. Specifically we will need to:

1. Develop the knowledge collection: there will need to be a more comprehensive biodiversity survey developed in order to document the local names of all the biota and to record the traditional uses of all local wildlife, plants, and the like. This will comprise the core of the local knowledge library. Local collectors will be trained to digitally photograph and preserve voucher specimens of all flora and fauna. These will be linked to information on local name, local use, and local lore. The community naturalists will contribute their knowledge of local species (behavior, ecology, etc.), all of which will go into a locally held library of knowledge managed by local experts and organized by key subjects. This will be, in essence, an ethnological / environmental / linguistic field study center, where the information given by the elders will also be housed.

So that the Hewa will have a copy of everything, we plan to create books of the myths, lore, language etc. that will be housed at Wanakipa station. These books will be written in both English and the local language, and will also serve the pre-literate community through the use of pictures and symbols. I am in the process of developing a local language guide on birds based on traditional Hewan knowledge to be housed in our local library of knowledge. This book will be delivered in 2011. At the same time, partner institutions will serve as a permanent repository for all voucher material, and, in return, will cover the cost of the salaries for the local stewards to make and document these collections. For their efforts, the partner institution will receive a priceless and comprehensive collection of the flora / fauna / material culture of a unique New Guinea society, and the community will begin to see the value of its cultural and biological inheritance.

2. Develop knowledge-based enterprise projects: it is our intent that self-sustaining activities will be established with funding support from the partner institutions. Therefore, the aforementioned knowledge library will also double as a field station for research. As the community completes its knowledge library, and as residents become more steeped in this knowledge, the library will attract more researchers and students, much the same way scientists are attracted to long-standing field stations. Here powerful and cutting-edge research can be conducted in partnership with a savvy, well trained, and very knowledgeable local community. It is this that will bring economic opportunity. For example, an ornithologist coming to this community to conduct bird surveys will find young field assistants who know the names, habits, and vocalizations of all the birds - a boon to the research. Visiting linguists can expect a welcome reception from the array of local language historians who have worked together to document the richness of the customary language. An ethnologist who works here will benefit from a widespread interest in all aspects of the society's customs and traditional lifestyle. It is likely that partner institutions may want to establish their own field stations on the site and arrange for annual field scientist visits. This will provide employment opportunities for members of the Hewa community.

Although the Hewa speak a spattering of Pidgin, the aim of the Forest Stewards is to conserve as much as possible of this unique culture in their own language, so that less will be lost in translation. So that knowledge team members can communicate with their research partners, an adult literacy program will be introduced in the participating community. The Hewa Forest Stewards program has received commitments from partners to begin an adult literacy program in 2009. Some community participants must also learn English to make their knowledge more accessible to researchers and to ensure long-term employment opportunities for the community. At the same time, local knowledge schools will be created wherein the elders will convey their knowledge of language, nature, community history, stories / myths, skills, products / crafts etc. to the next generation of knowledge stewards and researchers. This will establish the first steps toward capturing and conserving local knowledge.

3. Create a community endowment: it is my hope that this project will attract enough partners and funding to fund an endowment. This endowment – would have two objectives: First, it should enable the community to meet the yearly expenses of the mentors (ensuring, for example, that Hewa get paid throughout the year to look after the corridor areas) without touching the fund's principle. Second, the endowment should fund non-profit activities like community health care and literacy. At present, the community seems to be focused on enhancing the educational materials available at the school and

supplying the aid post. We have six trained Hewan health workers (courtesy of the Lutheran hospital in Enga) currently living at Wanakipa station. Eventually as the endowment grows and access fees replenish the principal, the Forest Stewards will be assured of long-term sustainability. This is why partners with a long-term stake in New Guinea - like the Bishop Museum - are so important. Both the institution and the scientists that it links with the Forest Stewards can profit professionally from working with the knowledge library as well as working in person with the Forest Stewards. These scientists are accustomed to paying for the privilege, and the partner institution is willing to provide a conduit for the Hewa and other groups to receive these funds. By establishing an endowment and affordable pay rates for the participants in New Guinea, this project aims to provide a predictable level of income for the participants and avoid the pitfalls associated with inconsistent funding.

Discussion

Forest Stewards project represents a paradigm shift for conservation in the twenty-first century. Although it is always dangerous to generalize to other cultures, the Hewa have put their land use in a context that illustrates the perils of conflating a small-scale disturbance regime with sustainable management. Rather than portraying themselves as capable of performing a super human balancing act, the Hewa describe their traditional gardening purely as a source of disturbance on this landscape. At the current level of gardening, the Hewa actually increase the biodiversity of their lands. By felling the forest, they create a mosaic of primary forest, secondary forest, grasslands, gardens and the various phases of succession growth (gamma diversity). They also create habitats for organisms that cannot survive in the primary forest (alpha diversity). However, gardening creates areas that are lower in biodiversity than the surrounding primary forest, as well as a succession environment that will not be visited by most of the fruit and nectar eating birds this forest depends on for regeneration. Known as beta diversity, this comparative measure of biological diversity can serve as a warning that each stage of forest regeneration will be less diverse than the primary forest. The Hewa are creating habitats each of which is less diverse than the primary forest. The current diversity is a by-product of traditional land use by a small, mobile society. While the current mosaic is more diverse than mountains covered exclusively in undisturbed primary forest, the replacement of primary forest by secondary growth will diminish the biodiversity of the Hewa homeland. Their knowledge of this dynamic provides an important insight into the ability of indigenous man to use the environment without compromising the biological diversity.

Through local empowerment and capacity building, this approach offers an isolated forest society a pathway toward sustainable economic development that also fosters nature conservation. We believe the most valuable resources to be found in the Star Mountains wilderness are its people and remarkable biodiversity. This project turns culture, language and land rights - normally seen as barriers to development and conservation - into assets by placing a monetary value on them. Typically, traditional languages are jettisoned by smaller societies, because they pose a barrier to assimilation and the creation of wealth in the modern world. For the Forest Stewards partners, language will be an asset - the key to empowerment and income. These native languages hold the key to unlocking the natural world that Forest Stewards communities have managed for centuries. By fostering intergenerational and cross-cultural communication, the Forest Stewards program allows communities to use their traditions to participate more fully in decisions about resource conservation. Such dialogues can help to promote sustainable development and resilience in otherwise fragile ecosystems (Aubel 2010; Moller, Lyver 2010). In remote areas with no other source of income, we believe that the Forest Stewards concept offers the possibility to both meet the aspirations of developing societies, while conserving globally significant forests.

We understand that the Forest Stewards program will influence the development trajectory of the Hewa community. However, because we have established a linkage between the biodiversity found in these forests and tradition, as well as between this product and payment, we believe that we can avoid the development of a “cargo cult” mentality wherein communities expect that foreigners will give the community goods and services unconditionally. We also understand that the Hewa will develop regardless of the program’s efforts, and that, given the PNG context of resource exploitation, the options bestowed by the program provide irrefutably more benefit than detriment. All involved understand that without the forests to keep their traditional environmental knowledge alive, there can be no Forest Stewards program.

In the long run, the Forest Stewards concept presents the possibility of conserving cultural and ecological resources for future generations, who given the opportunity to understand the value of these resources will take measures to protect them. By mobilizing individuals who are dedicated to empowering other members of their community, we are confident that we will conserve Melanesia's most important wilderness and the cultures that have shaped it.

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